

WHAT IS CLAIMED IS:

1. A signal output apparatus comprising: an impact  
applying unit applying an impact to a sheet from the  
outside thereof; and a detection unit outputting a signal  
5 by the impact.

2. The signal output apparatus according to claim  
1, wherein said detection unit comprises a piezoelectric  
element.  
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3. The signal output apparatus according to claim  
1, wherein said detection unit is provided on an elastic  
member.

4. The signal output apparatus according to claim  
1, wherein said detection unit is provided in a position  
opposite to said impact applying unit with said sheet  
therebetween.  
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5. The signal output apparatus according to claim  
4, wherein said detection unit is provided on the bottom  
face of a recess of a substrate having the recess.  
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6. The signal output apparatus according to claim  
1, wherein said detection unit is mounted on said impact  
applying unit.  
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7. The signal output apparatus according to claim  
1, comprising a plurality of said detection units.

8. The signal output apparatus according to claim  
5 1, wherein said detection units are each provided on the  
face side and the back side of said sheet.

9. The signal output apparatus according to claim  
1, wherein said impact is applied to said sheet at the  
10 time when said sheet is in the static state.

10. The signal output apparatus according to claim  
9, wherein the time when said sheet is in the static state  
means the time when said sheet is not substantially being  
15 conveyed.

11. The signal output apparatus according to claim  
1, wherein at the time when said impact is applied, said  
impact applying unit is transited from the state in which  
20 said impact applying unit does not contact said sheet to  
the state in which said impact applying unit contacts said  
sheet.

12. The signal output apparatus according to claim  
25 1, wherein at the time when said impact is applied, said  
detection unit comes into contact with said sheet.

13. The signal output apparatus according to claim 1, wherein said signal is a signal for use in determination of the type of said sheet.

5           14. An apparatus for determining the type of sheet, comprising: an impact applying unit applying an impact to a sheet from the outside thereof; and a detection unit outputting a signal by the impact, wherein the type of the sheet is determined based on the signal from the  
10   detection unit.

15           15. The apparatus according to claim 14, wherein the type of said sheet is determined using information about sheets stored in advance and the signal from said  
15   detection unit.

20           16. The apparatus according to claim 14, wherein the application of said impact is carried out at the time when said sheet is in the static state.

            17. The apparatus according to claim 14, wherein the type of said sheet is determined using the peak value of an output signal from said detection unit.

25           18. The apparatus according to claim 14, wherein the type of said sheet is determined using the number of peaks of the output signal from said detection unit or

the time interval between the peaks.

19. The apparatus according to claim 14, wherein  
the type of said sheet is determined using the nth peak  
5 value and the  $(n+\alpha)$ th peak value ( $\alpha$  represents a natural number) of the output signal from  
said detection unit.

20. The apparatus according to claim 14, wherein  
10 the type of said sheet is determined using a recoil period  
of said impact applying unit.

21. The apparatus according to claim 20, wherein  
a predetermined pulse is generated during a period of time  
15 between the nth collision and the  $(n+1)$  collision, and  
said recoil period is measured from the number of clock  
pulses generated in an AND circuit of the pulse and an  
external clock pulse.

20 22. The apparatus according to claim 14, wherein  
the type of said sheet is determined using the time  
interval between the nth collision ( $n$  represents an  
integer number equal to or greater than 1) and the mth  
collision ( $m$  represent an integer number equal to or  
25 greater than 2, and  $m > n$  holds).

23. The apparatus for according to claim 14

further comprising:

a pulse-generating means for generating a pulse in response to a signal outputted from the detection unit at or above a prescribed threshold level,

5 a threshold-setting means for setting the threshold, and

an identifying means for identifying a type of the sheet material according to the outputted pulse generated by the pulse-generating means in comparison with the set  
10 threshold,

wherein the threshold-setting means sets the threshold according to the form of the output signal.

24. The apparatus according to claim 23, wherein  
15 the threshold is set corresponding to the time after collision of the impact applying unit against the sheet material.

25. The apparatus according to claim 23, wherein  
20 the threshold is set in correspondence with the signal intensity having been detected in preliminary collision of the impact applying unit against the sheet material before identification of the sheet material.

25 26. The apparatus according to claim 23, wherein the threshold is set in accordance with the maximum and the minimum of the signal generated by one collision of

the impact applying unit.

27. The apparatus according to claim 23, wherein the apparatus comprises further an interval-computing means for computing the interval between the pulses generated by the pulse generating means, and an identifying means for identifying the type of the sheet material based on computation by the interval-computing means.

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28. The apparatus according to claim 23, wherein the threshold-setting means sets the threshold for the second or later collision of the impact applying unit.

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29. The apparatus for determining the type of sheet according to claim 23, wherein the threshold-setting means computes a threshold from the maximum and the minimum of the signal outputted from the detection unit on the collision and feed the computed threshold to the pulse-generating means as the threshold for the subsequent collision.

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30. The apparatus according to claim 23, wherein an initial threshold-setting means is provided for setting the threshold for the first collision of the impact applying unit, the initial threshold-setting means computing the initial threshold from the output

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from the detection unit in collision of the impact applying unit against the sheet material preliminarily before identification of the sheet material.

5           31. An image forming apparatus comprising: an impact applying unit applying an impact to a sheet from the outside thereof; and a detection unit outputting a signal by the impact.

10           32. The image forming apparatus according to claim 31, wherein the type of sheet is determined based on the signal from said detection unit to define conditions for an item to be controlled.

15           33. The image forming apparatus according to claim 31, wherein the type of said sheet is determined in said image forming apparatus.

20           34. The image forming apparatus according to claim 31, wherein the type of said sheet is determined in a computer externally connected to said image forming apparatus.

25           35. The image forming apparatus according to claim 32, wherein said item to be controlled is at least one selected from the group consisting of the space between rollers for conveying the sheet, the pressure between the

conveying rollers and the conveyance speed.

36. The image forming apparatus according to claim  
31, wherein said image forming apparatus forms an image  
5 by discharging ink, and said item to be controlled is the  
amount of ink to be discharged.

37. The image forming apparatus according to claim  
31, wherein said image forming apparatus forms an image  
10 using a toner, and said item to be controlled is the  
temperature of sheet.

38. An image-forming apparatus comprising an  
apparatus for determining the type of sheet, and an  
15 image-forming section for forming an image under  
conditions corresponding to the identified sheet  
material, wherein

the apparatus for determining the type of sheet  
comprises

20 an impact applying unit for applying an impact  
against a sheet material,

a detection unit for outputting a signal in response  
to the impact,

a pulse-generating means for generating a pulse in  
25 response to a signal outputted from the detection unit  
at or above a prescribed threshold level, and

a threshold-setting means for setting the threshold



in correspondence with intensity of the signal.

39. The image-forming apparatus according to claim 38, wherein the threshold-setting means computes  
5 the threshold on start or reset of the image-forming apparatus.

40. The image-forming apparatus according to claim 38, wherein the threshold-setting means computes  
10 the threshold when a change of the sheet material is expected.

41. A method for determining the type of sheet, comprising the steps of: applying an impact to a sheet  
15 from the outside thereof; outputting a signal from a detection unit by the applying step; and determining the type of sheet based on the signal.

42. The method according to claim 41, wherein said  
20 applying step is carried out at the time when said sheet is in the static state.

43. A method of identifying a type of a sheet material comprising the steps:  
25 applying an impact force to the sheet material;  
detecting attenuation of the applied impact force by the sheet material;

outputting a signal in correspondence with the  
detected force;

generating a pulse when the signal is at or above  
a prescribed threshold;

5        setting the prescribed threshold; and

identifying the type of the sheet material based  
on the output of the pulse generated according to the  
threshold set above,

wherein the threshold is set according to the output state  
10    of the signal.

44. An information output apparatus used in an  
image forming apparatus, comprising: an impact applying  
unit applying an impact to a target from the outside  
15    thereof; and a detection unit outputting information by  
the impact.

45. The information output apparatus according to  
claim 44, wherein said target is a liquid container, and  
20    said impact is an external force other than vibration.